



STATE OF MICHIGAN  
DEPARTMENT OF EDUCATION  
LANSING



July 24, 2002

**MEMORANDUM**

**TO:** State Board of Education

**FROM:** Thomas D. Watkins, Jr., Chairman

**SUBJECT:** Approval of Standards for the Preparation of Biology Teachers

In pursuit of its goal to improve teacher quality, the State Board of Education receives proposals for the adoption and revision of program standards for teacher preparation. Proposed standards are developed to reflect and support Michigan's K-12 Curriculum Framework and Benchmarks, as well as standards adopted by national professional/specialty area organizations.

Over the last several years, a referent group reflecting the interests of public and independent teacher preparation institutions and K-12 teachers worked on the development of standards for the preparation of biology teachers. The committee began its work by reviewing the Michigan Curriculum Framework for science and standards for the preparation of teachers as developed by the National Science Teachers Association to ensure alignment with both documents.

Ongoing feedback from K-12 schools and teacher preparation institutions from 2000 through 2002 was utilized in making significant revisions to an earlier proposal. A draft was forwarded to selected groups/organizations, all Michigan teacher preparation institutions, and a random sample of intermediate and local school districts for review and comment in September 2000. As presented in Attachment 1, the standards reflect the feedback received. Additional information regarding the standards development and review process is provided in Attachment 2.

The proposal was reviewed by the Board-appointed Professional Standards Commission for Teachers and is recommended for adoption by the State Board of Education.

It is recommended that the State Board of Education approve the standards for the preparation of biology teachers, as discussed in the Superintendent's memorandum dated July 24, 2002.

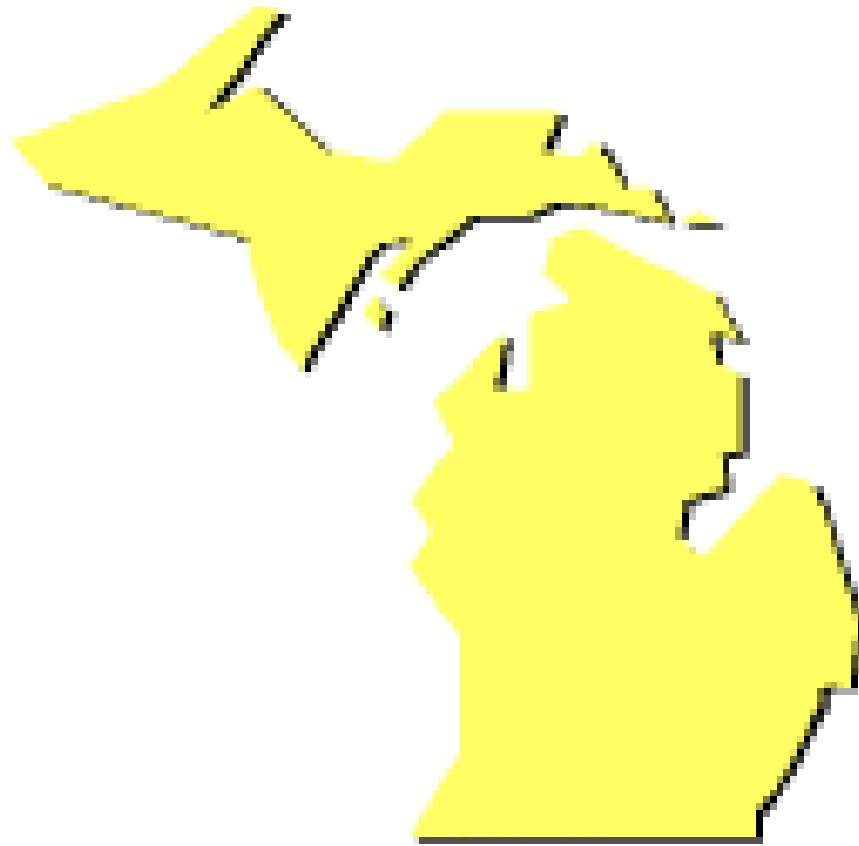
Proposal to the  
Michigan State Board of Education  
For the Preparation of Teachers

**Biology (DA)**

Submitted by the  
Office of Professional Preparation Services  
July 24, 2002

# Standards for the Preparation of Teachers

## **Biology (DA)**



Adopted by the Michigan State Board of Education  
<date>

# **Standards for the Preparation of Teachers of Biology (DA Endorsement)**

## **Preface**

### **Development of the Proposal**

Over the last several years, a referent group of professional educators developed a proposal to adopt standards for the preparation of biology teachers. These standards align with standards developed by the National Science Teachers Association and the Michigan Curriculum Framework for science education. Teachers who receive the endorsement in biology would be prepared to teach any biology or life science course at their certificate level.

To provide information and gather feedback on the proposal, a copy was also forwarded to selected groups/organizations, all Michigan teacher preparation institutions, and a random sample of intermediate and local school districts for review and comment. As presented in this document, the standards reflect the feedback received.

State Board adoption of these standards typically leads to the creation of a new certification test for teachers prepared to teach this content area. Test development for a new Michigan Test for Teacher Certification in biology will be scheduled according to the recommendation of the Standing Technical Advisory Council.

### **Approval of Programs**

Teacher preparation institutions that wish to continue to offer programs to prepare biology teachers are required to submit an application for program approval that demonstrates how the new standards are met throughout the proposed curriculum. The programs must be re-approved to show compliance with the new standards. Following initial approval, the teacher preparation programs will be reviewed every five years through the Periodic Review/Program Evaluation process.

## Content Guidelines/Standards Matrix

College/University	Code	
		DA
Source of Guidelines/Standards	Michigan State Board of Education, 2002	Program/Subject Area
		Biology

### Levels of proficiency are identified as follows:

#### A – Awareness

The biology teacher recognizes/recalls the existence of different aspects of biological science and related teaching strategies.

#### B – Basic Understanding

The biology teacher articulates knowledge about biological science and related instructional and assessment strategies. The biology teacher demonstrates proficiency in using the knowledge at a fundamental level of competence acceptable for teaching.

#### C – Comprehensive Understanding

The biology teacher is able to apply broad, in-depth knowledge of the different aspects of biological science in a variety of settings. (This level is not intended to reflect mastery; all teachers are expected to be lifelong learners.)

**DIRECTIONS:** List required courses on matrix and provide additional narrative to explain how standards are met. If electives are included, they should be clearly indicated. Adjust size of cells as needed.

Guideline/Standard		Courses and/or Experiences that Fulfill the Guideline	
		Secondary Minor	Secondary Major
Submit a narrative that explains how this program:			
A.	uses the Michigan Curriculum Framework K-12 Science Content Standards and Benchmarks as the critical foundation for teacher preparation, ensuring that Biology teachers have the content knowledge and the ability to teach this curriculum; and		
B.	develops an understanding of the interconnectedness of all science, including the major concepts of chemistry, the earth/space sciences, and physics, and relates this understanding to the teaching of biology and the life sciences.		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
	<b>The preparation of high school biology teachers will enable them to:</b>			
1.0	understand the life sciences to include cellular functioning, the organization of living things, concepts of heredity, evolutionary changes, and ecological systems, as illuminated within Strand III of the Science Content Standards and Benchmarks found in the Michigan Curriculum Framework;			
2.0	construct new knowledge by using research, reading and discussion, and reflect in an informed way on the role of science in human affairs; and			
3.0	understand and develop the major concepts and principles of biology, including concepts in:			
3.1	Cellular Function, including			
3.1.1	cell theory	B		
3.1.2	cell types	B		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
3.1.3	cell structure and function	C		
3.1.4	protein synthesis	C		
3.1.5	cell division (mitosis and meiosis)	C		
3.2	Organization of Living Things, including			
3.2.1	life cycles (including sexual and asexual reproduction)	C		
3.2.2	systems	C		
3.2.3	classification	C		
3.2.4	growth and development	B		
3.2.5	photosynthesis	C		
3.2.6	cellular respiration	C		
3.2.7	living and nonliving	C		



No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
3.3	Concepts of Heredity, including			
3.3.1	Mendelian genetics	C		
3.3.2	molecular genetics (structure of DNA)	C		
3.3.3	modern genetics (electrophoresis, genetic engineering, DNA fingerprinting, etc.)	C		
3.3.4	population genetics	B		
3.4	Evolutionary Changes, including			
3.4.1	diversity/speciation	B		
3.4.2	adaptation and natural selection	C		
3.4.3	fossils/ancient life	A		
3.4.4	extinction	B		
3.5	Ecological Systems, including			

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
3.5.1	community relationships, including predator/prey and symbiosis	C		
3.5.2	population	B		
3.5.3	transfer of energy (food chains/webs)	C		
3.5.4	biogeochemical cycles	C		
3.5.5	human impact	C		
3.6	Human Biology, including			
3.6.1	anatomy and physiology	C		
3.6.2	disease and immunology	B		
3.6.3	health habits	B		
3.6.4	resource management	B		
3.6.5	human population growth and diversity	B		

No.	Guideline/Standard	Courses and/or Experiences that Fulfill the Guideline	
		Secondary Minor	Secondary Major
	<b>The preparation of high school biology teachers will enable them to:</b>		
4.0	develop an understanding and appreciation for the nature of scientific inquiry;		
5.0	relate the concepts of biology to contemporary, historical, technological and societal issues; in particular, relate concepts of biology to current controversies, such as those around cloning, medical research, and genetically-modified food, as well as other issues;		
6.0	apply mathematics, including statistics, to investigations in biology/life sciences and the analysis of data;		
7.0	understand and promote the maintenance of a safe science classroom as identified by the Council of State Science Supervisors, and including the ethical and appropriate use and care for living organisms and scientific equipment, and the safe storage, use, and disposal of chemicals;		
8.0	locate resources, design and conduct inquiry-based open-ended investigations in biology, interpret findings, communicate results, and make judgments based on evidence;		
9.0	demonstrate competence in the practice of teaching through investigative experiences by demonstrating the application of the scientific processes, and in assessing student learning through multiple processes;		

<b>No.</b>	<b>Guideline/Standard</b>	<b>Courses and/or Experiences that Fulfill the Guideline</b>	
		<b>Secondary Minor</b>	<b>Secondary Major</b>
10.0	create and maintain an educational environment in which conceptual understanding will occur for all science students; and		
11.0	demonstrate competence in the practice of teaching as defined within the Entry-Level Standards for Michigan Teachers, as observed during the directed teaching experience.		

## List for Distribution of Draft Standards

### Biology (DA)

**Teacher Preparation Standards Development Committee  
for  
Biology, Chemistry, Physics, Physical Science, Earth/Space Science,  
Integrated Science – Elementary, and Integrated Science – Secondary**

Maurice Barnes	Grand Rapids Central High School
Frank Ciloski	Michigan Department of Education
Claudia Douglass	Central Michigan University
Ray Francis	Central Michigan University
David Frank	Ferris State University
Dan Genter	Dansville High School
Jim Hewitt	Saginaw Valley State University
Stanley Hirachi	Central Michigan University
Joseph Krajcik	University of Michigan
David Klingbiel	Dansville High School
Mozell Lang	Michigan Department of Education
Peggy Liggett	Eastern Michigan University
Catherine Smith	Michigan Department of Education
Deborah Smith	Michigan State University
Steven Stegink	Grand Rapids Public Schools
Jane Teska	Southfield Public Schools
Denny Travis	Oakland University
Sue Wittick	Michigan Department of Education

## **List for Distribution of Draft Standards Biology (DA)**

### **Educational Organizations**

Association of Independent Colleges & Universities of Michigan

Directors and Representatives of Teacher Education Programs

\* Michigan Association of Colleges for Teacher Education

Michigan Association of Nonpublic Schools

Michigan Association of School Administrators

Michigan Association of School Boards

Michigan Association of School Personnel Administrators

Michigan Association of Secondary School Principals

Michigan Association of Supervision & Curriculum Development

Michigan Association of Teacher Educators

Michigan Congress of Parents, Teachers, and Students

Michigan Deans' Council

\* Michigan Earth Science Teachers Association

Michigan Education Association

Michigan Elementary & Middle School Principals Association

Michigan Federation of Teachers & School Related Personnel

Michigan Science Teachers Association

Middle Cities Education Association

Professional Standards Commission for Teachers

\* Indicates submission of a response

## **Teacher Preparation Institutions**

### **Biology (DA)**

- |                                 |                                     |
|---------------------------------|-------------------------------------|
| * Adrian College                | * Madonna University                |
| Albion College                  | * Marygrove College                 |
| Alma College                    | * Michigan State University         |
| * Andrews University            | Michigan Technological University   |
| Aquinas College                 | Northern Michigan University        |
| Calvin College                  | * Oakland University                |
| Central Michigan University     | Olivet College                      |
| Concordia University            | Saginaw Valley State University     |
| Cornerstone University          | Siena Heights University            |
| * Eastern Michigan University   | * Spring Arbor University           |
| Ferris State University         | * University of Michigan – Dearborn |
| * Grand Valley State University | University of Michigan – Flint      |
| Hillsdale College               | University of Detroit Mercy         |
| Hope College                    | * University of Michigan            |
| * Kalamazoo College             | * Wayne State University            |
| Lake Superior State University  | * Western Michigan University       |

\* Indicates submission of a response

**Local School Districts**  
**Biology (DA)**

Armada Area Schools	Kalkaska Public Schools
Bangor Public Schools	Lansing School District
Van Buren Public Schools	Lakeview Community Schools
Boyne Falls Public Schools	Mackinac Island Public Schools
Atherton Community Schools	Marshall-Mar Lee School District
* Carsonville-Port Sanilac Schools	Middleton-Fulton Schools
Clare Public Schools	Mt. Morris Consolidated Schools
Constantine Schools	New Haven Community Schools
Decatur Public Schools	Okemos Public Schools
East China School District	Paradise-Whitefish Township Schools
* Engadine Consolidated Schools	Pinconning Area Schools
Flat Rock Community Schools	Reading Community Schools
Fruitport Community Schools	Rogers City Area Schools
Grand Marais-Burt Township Schools	Scottville-Mason County Central Schools
Hamilton Community Schools	
Hastings School District	
* Hanover-Horton Schools	
Iron Mountain-North Dickinson County Schools	

\*Indicates submission of a response



**Intermediate School Districts (ISD)  
Biology (DA)**

Allegan County  
Charlevoix-Emmet  
Dickinson-Iron  
Huron  
Ionia County  
Lapeer  
Mason-Lake  
Newaygo  
St. Joseph  
Washtenaw

\*Indicates submission of a response

NOTE: Additional responses were received anonymously.